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A new enid genus and species from northern Sichuan, China (Gastropoda: Stylommatophora: Enidae)

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Abstract: *Cheniena cheni* **gen. & sp. nov.** is described from Sichuan Province, southwest China. This new genus is distinguished by its conical shell, open umbilicus, and the structure of its apertural barriers. *Cheniena cheni* **sp. nov.** is diagnosed by its distinct keel among all other enids. The genitalia of this new species are revealed for comparison with other species. *Cheniena huangi* (Chen, 2020) **comb. nov.** can be reassigned to the new genus according to the shell morphology.

Keywords: dry-hot valley, land snail, morphology, new taxa, taxonomy

四川省北部艾纳螺科一新属新种记述（腹足纲：柄眼目：艾纳螺科）

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摘要：本文描述了产自四川省的一新属新种：仙境锥纳螺 *Cheniena cheni* **gen. & sp. nov.**。该新属以其锥形贝壳、开放的脐孔以及口缘障壁结构而区别于其他类群。仙境锥纳螺以其在所有已知烟管螺科物种中独特的壳脊为主要鉴别特征。本文还揭示了该新种的生殖系统结构，并与相关类群进行了比较。根据贝壳形态特征，黄氏锥纳螺 *Cheniena huangi* (Chen, 2020) **comb. nov.** 应归入该新属。

关键词：干热河谷 陆生贝类 形态学 新阶元 分类学

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Introduction

The Enidae Woodard, 1903 is a land snail group widely distributed in Eurasia, North Africa and Oceania, with most species having a long and morphologically variable penial appendix (Schileyko 1998; Wu 2018). The dry-hot valleys of southwest China harboured the highest species diversity of Asian enids, and its species have been extensively studied (Wu 2018; Chen 2020; Chen *et al*. 2024ab). Among them, *Pupopsis huangi* Chen, 2020, previously recorded from Wenchuan, Sichuan, has a conical shell that is unique to other congeners of the genus (Chen 2020). However, due to the lack of potential affinity and anatomical data, it was conservatively placed in *Pupopsis* Gredler, 1898.

Recent fieldwork in Jiuzhaigou County, Sichuan Province, yielded an enid species with a distinctive keel, which was recognized as a new species at first sight. Further examination suggests the shell shape and apertural barriers of the new species share potential homology with *Pupopsis huangi* Chen, 2020, and both are different from other members of *Pupopsis*. Therefore, a new genus is erected for them.

Material and methods

Observations and dissection were performed using a Zeiss® Stemi SV6 stereo zoom microscope. Record photos of the genitalia for drawing were taken with an Olympus® C5050 connected via a C-3040 ADU to the above stereomicroscope. The shells were measured with a digital vernier calliper to the nearest 0.1 mm. Whorls were counted as described by Kerney & Cameron (1979). Terminology follows Wu (2018), defined the genital atrium as proximal. Photographs of the shell were taken using a Canon® 5D Mark IV camera with a Laowa® 25mm f/2.8 2.5-5X Ultra Macro lens and modified in Adobe® Photoshop 2021. Type specimens of the new species were deposited in mollusc collection of the Museum of Hebei University, Baoding, Hebei, China (**HBUMM**) and Zhong-Guang Chen's private collections (**CZG**).

Taxonomy

Family Enidae Woodward, 1903 (1880)

Cheniena Z.-Y. Chen & Z.-G. Chen, gen. nov.

https://zoobank.org/B9E3E5F0-FFEA-430C-B402-0A617A374338

Type species. *Cheniena cheni* Z.-Y. Chen & Z.-G. Chen, **sp. nov.**

Diagnosis. Shell small, conical, light-brownish, consisting of 5–6 slightly convex and regularly increasing whorls; teleoconch gradually widening, with dense and irregular growth lines; aperture nearly oval, distinctly turning upward; peristome strongly expanded but not reflected, upper palatal and parietal edge almost attached to the suture; angular tubercle strongly developed; apertural barriers do not reach the peristome; one strong parietal plica present, distanced with angular tubercle inner side lower; one developed palatal plica present; two strong columellar lamellae present, usually parallel but situated at different depths; umbilicus open, cavernous, approximately ⅕ of the shell width.

Epiphallus long, cylindrical; epiphallic caecum present, small, located near penis; flagellum long; tubular with a pointed tip; penial appendix long, branched off from penis at atrium, vagina short, bursa copulatrix duct long, proximally straight; bursa copulatrix tubular, without stalk, without apical ligament; diverticle absent.

Differential diagnosis. The new genus can be assigned to Enidae based on the apertural barriers and presence of a penial appendix branching from the penis at the atrium. Although the general shell shape is quite different, the similar apertural barriers of the new genus may share homology with those of *Clausiliopsis* Möllendorff, 1901 and *Pupopsis* Gredler, 1898 (see Wu & Wu 2009; Wu & Gao 2010). In comparison with these two genera, the apertural

barriers (except angular tubercle) of the new genus are very deep and do not extend to the peristome. Additionally, the palatal plica and angular tubercle are quite far apart, and two separated columellar lamellae are present. The conical shell and open umbilicus of the new genus are not unique to other Enidae genera, similar shell shape is also found in some *Serina* Gredler, 1898 and *Subzebrinus* Westerlund, 1887 [e.g., *Subzebrinus tigricolor* (Annandale, 1924) and *Serina vincentii* (Gredler, 1898)], but none of the latter have complex shell apertural barriers like the new genus (see Wu & Xu 2013; Wu 2018). *Pupopsis huangi* Z.-Y. Chen, 2020 can also be assignable to the new genus based on its conical shell and similar apertural barriers.

Currently, there is no effective way to distinguish the Chinese enid genera in China using genital morphology. The new genus has a significantly long epiphallus in comparison with the penis, showing its potential affiliate with *Clausiliopsis* Möllendorff, 1901 (see Wu & Wu 2009). The unexpanded bursa copulatrix in the new genus and the absence of diverticulum are unique among all Chinese enid genera.

Etymology. The new genus is named after the famous Chinese invertebrate zoologist, Yi Chen [陳義, 1900–1974], combined with genus suffix *Ena*.

Distribution. China: Sichuan (Min Mountains)

Chinese common name: 锥纳螺属 zhuī nà luó shǔ

FIGURE 1. Shell of *Cheniena cheni* Z.-Y. Chen & Z.-G. Chen, **sp. nov.** (holotype HBUMM 10075). Scale bar: 5 mm.

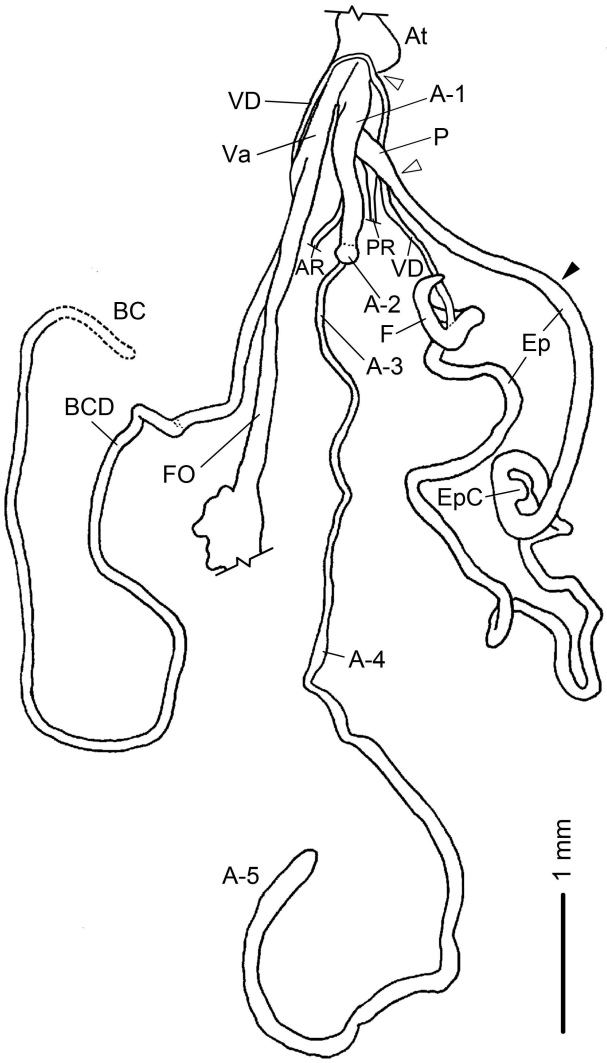

FIGURE 2. Genitalia of *Cheniena cheni* Z.-Y. Chen & Z.-G. Chen, **sp. nov.** (holotype HBUMM 10075). Solid arrow indicates the beginning of epiphallus; hollow arrows indicate the range of penis, bursa copulatrix; the dashed line on the bursa copulatrix indicates damage incurred during dissection; the structure was intact and confirmed in previous dissections. Abbreviations: A-1–A-5, five sections of penial appendix; At, atrium; AR, retractor muscle of appendicular branch; BC, bursa copulatrix; BCD, bursa copulatrix duct; Ep, epiphallus; EpC, epiphallic caecum; F, flagellum; FO, free oviduct; P, penis; PR, retractor muscle of penis; Va, vagina; VD, vas deferens.

Cheniena cheni Z.-Y. Chen & Z.-G. Chen, sp. nov.

https://zoobank.org/D02D4811-DB86-44FC-A2F4-C07B7DDF271D

Figs 1, 2

Types examined. *Holotype*. HBUMM 10075, Qinglong Village [青龙村], Guoyuan Township [郭元乡], Jiuzhaigou County [九寨沟县], Aba Tibetan and Qiang Autonomous Prefecture [阿坝藏族羌族自治州], Sichuan Province, China, 33°05’08.21”N, 104°20’53.70”E, 24 September 2020, leg. Zhong-Guang Chen. *Paratypes*. CZG/1, same data as holotype; CZG/10, same location as holotype, August 2024, leg. Zhong-Guang Chen & Meng-Hua Li.

Diagnosis. A small enid species with conical light-brownish shell and strong keel at the shell periphery; an angular tubercle strongly developed; one strong parietal plica present, separated from angular tubercle; one node-like strong palatal plica and two columellar lamellae present; umbilicus open, cavernous.

Description. Shell (Figure 1) small, dextral, light-brownish, conical, consisting of 5.75 slightly convex and regularly increasing whorls, wider than high, suture shallow; shell periphery with angle, forming strong keel at body whorl; base of body whorl flatted; protoconch consists of one smooth and slightly glossy whorl; teleoconch gradually expanding, with dense and irregular growth lines; aperture nearly oval, distinctly turning upward; peristome strongly expanded but not reflected, upper palatal and parietal edge almost attached to suture; callus thickened, translucent, not elevated; angular tubercle strongly developed; apertural barriers do not reach peristome; one strong parietal plica present, distanced with angular tubercle inner side lower; one developed palatal plica present with nearly triangular base, upward strongly twisted, does not extend inwards; two strong columellar lamellae present, parallel but situated at different depths, not on one line; shallower columellar lamella opposite to palatal plica. umbilicus open, cavernous, approximately ⅕ of shell width.

Genitalia (Figure 2). Vas deferens relatively short, uniform thickness; entering epiphallus apically with distinct demarcation; epiphallus long, cylindrical, forming numerous loops; externally smooth; epiphallic caecum present, small, blunt apically, located near penis; flagellum long, tubular, proximally normal, with tip pointed; penis without distinct terminal entrance of epiphallus, clavate, distally tapering; penial caecum absent; penial appendix long, branched off from penis at atrium, divided into sections including A-1+A-2, A-3 and A-4+A-5. A-1 and A-2 fused, A-2 and A-3 not fused, boundary between A-4 and A-5 indistinct, A-5 long, slightly convoluted; appendicular retractor and penial retractor relatively long, arising close to each other from diaphragm, divided into two branches; penial branch attaching to middle part of penis, appendicular branch attaching to A-1+A-2; additional retractor other than penial or appendicular absent; muscular band connecting vagina and epiphallus absent; atrium short, without retractor; free oviduct longer than vagina; vagina short, not swollen, straight, unpigmented; bursa copulatrix duct long; proximally straight; bursa copulatrix tubular, without stalk, without apical ligament, normal in size and weakly defined; diverticle absent.

Measurements. Shell height = 4.5 mm, shell width = 5.6 mm, aperture height = 2.4 mm, aperture width = 2.3 mm (holotype); shell height = 4.0–4.7 mm, shell width = 5.5–5.9 mm, aperture height = 2.3–2.5 mm, aperture width = 2.3–2.4 mm (paratypes, *n* = 5)

Differential diagnosis. The prominent keel of the new species can easily distinguish it from another species of the genus, *Cheniena huangi* (Chen, 2020). Additionally, the new species has stronger angular tubercle and parietal plica compared to *C. huangi*. The palatal plica of the new species is node-like, unlike the inwardly extending lamella seen in *C. huangi*.

Etymology. The new species is named after the recently deceased Chinese Malacologist, De-Niu Chen [陈德牛, 1939–2024].

Remarks. This species can only be found on the leaves of shrubs after rain and is difficult to see when the environment is dry.

Distribution. China: Sichuan. This species is known from the type locality only (Figure 3).

Chinese common name: 仙境锥纳螺 xiān jìng zhuī nà luó

Cheniena huangi (Chen, 2020) comb. nov.

Pupopsis huangi Chen, 2020: 133, figs 1–4.

Types examined. *Holotype*. HBUMM 10027 spec.1, “China, Sichuan Province, Tibetan Qiang Autonomous Prefecture of Ngawa [阿坝藏族羌族自治州], Wenchuan County [汶川县], 31°28.92’N, 103°35.22’E, alt. 1,300 m a.s.l.”, leg. Bo Huang, 3 June 2019. *Paratypes*. HBUMM 10027 spec. 2–5, same data as holotype.

Chinese common name: 黄氏锥纳螺 huáng shì zhuī nà luó

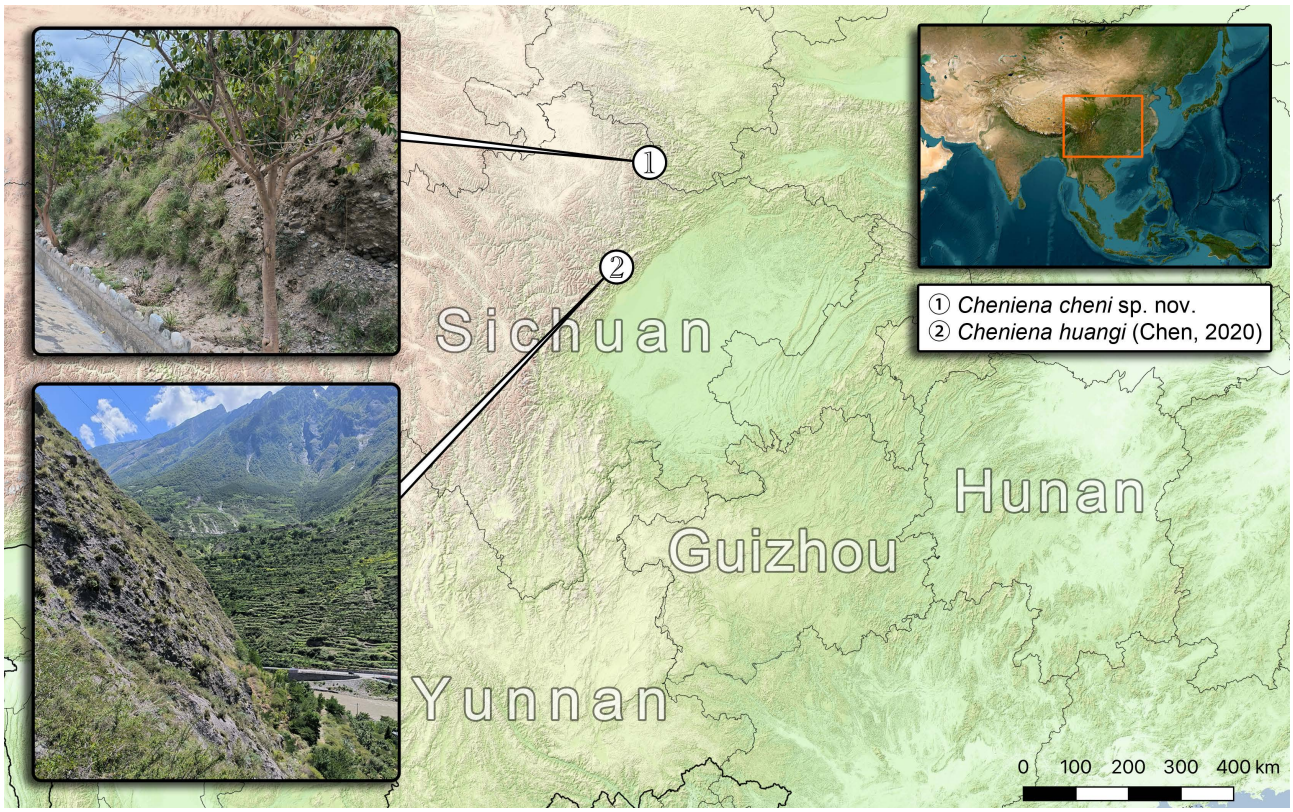

FIGURE 3. Known distribution and habitats of *Cheniena* Z.-Y. Chen & Z.-G. Chen, **gen. nov.**

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Additional information

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Photo Gallery

长额负蝗 *Atractomorpha lata* (Motschulsky, 1866)
Kaga, Japan
photograph by Hao JU [居皓]